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FURTHER OBSERVATIONS ON THE *OXALIS DILLENII* GROUP (OXALIDACEAE)

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ABSTRACT

Oxalis macrantha (synonym = *O. priceae*) is mostly restricted to limestone substrates (glades, chalk prairies, etc.) in Kentucky, Tennessee, and Alabama and is characterized by its completely hirsute-pilose stems, strongly rhizomatous-colonial habit, and large, red-lined corollas. *Oxalis colorea* also produces hirsute-pilose stems but the distal portions and the pedicels tend to be loosely strigose, and it also differs from *O. macrantha* in its less colonial habit and generally smaller corollas with a variable tendency to produce distinct red lines. Where their ranges meet, *O. colorea* apparently intergrades with *O. florida*, which, in its most distinct form, is a species of the Atlantic coastal plain, although plants in Texas, Louisiana, southwestern Mississippi, Arkansas, and Missouri also are identified here as *O. florida*. *Oxalis texana* produces densely and closely strigose stems like those of *O. dillenii* but differs in its larger, red-lined corollas, less colonial habit, and (in Texas, Louisiana, and Arkansas) characteristically woodland habitat; it is centered in Texas, Louisiana, and Arkansas, but as identified here it also occurs in a disjunct system in southern Alabama and adjacent Florida. County-level distribution maps are provided for *O. texana*, *O. macrantha*, *O. colorea*, and (in part) *O. florida*.

The *Oxalis dillenii* group as recognized here includes *O. dillenii* Jacq., *O. texana* (Small) Fedde, *O. macrantha* (Trel.) Small, *O. colorea* (Small) Fedde, and *O. florida* Salisb., all species native to eastern, southeastern, and south-central USA. *Oxalis dillenii* is the most widely distributed. The most consistent differences among them are primarily in vestiture, corolla size and coloration, and anther/stigma arrangement. Difficulties in identification, at least in some cases, are perhaps more related to infraspecific plasticity in morphology than to hybridization and blurred species bounaries, as sometimes has been assumed. *Oxalis colorea* and *O. florida*, however, apparently intergrade and have been treated as conspecific by Weakley et al. (2012). Further, it is possible that subgroups of plants identified here as *O. texana* and as *O. florida* have had independent origins.

Apparent dysploid variation in chromosome number is known in *Oxalis dillenii* and may be correlated with yet unrecognized variation patterns. Among the other species of the *O. dillenii* group, the chromosome number of only a single population of *O. florida* has been determined. Within sect. *Corniculatae*, the polymorphic *O. corniculata* L. is known to have both dysploid and polyploid

variants and *O. stricta* L. apparently has polyploid variants, at least suggesting that further biological studies in the *O. dillenii* group may be critical toward understanding the variation patterns.

Eiten (1963) reported his study of *Oxalis* sect. *Corniculatae*, which includes the *O. dillenii* group. Lourteig's study of sect. *Corniculatae* (1979) was more detailed in nomenclatural formality but she ignored (obviously intentionally) Eiten's study, not even mentioning or citing it. Nesom (2009) attempted to further clarify the taxonomy of the *O. dillenii* group, differing from Eiten in recognition of some entities and the rank at which they were treated but agreeing in general more closely with Eiten than with Lourteig. The current study again moves closer to agreement with Eiten's earlier concepts of taxa, although nomenclature in some cases is different.

The current study was precipitated by two general observations.

* Field observations in northern Alabama by Spaulding indicated to him that the limestone glade populations identified as *O. macrantha* by Nesom (2009, mistakenly using the later name *O. priceae*) are different from the villous-stemmed plants that generally occur in woodland habitats, thus Nesom's concept of *O. macrantha* included two species.

* Field observations in southern Alabama by Horne and restudy of herbarium material indicated that *Oxalis texana* does indeed occur there. Nesom (2009) restricted its range to Texas, Louisiana, and Arkansas although Eiten (1963) had observed that it occurs eastward to Alabama, Georgia, and Florida. Ward (2004) noted that these putative eastern disjunctions of *O. texana* in Florida were based on misidentifications, but Alabama and Florida collections are tentatively identified here as *O. texana*.

The main observations of the current study are these.

* *Oxalis macrantha* (synonym = *O. priceae*) is restricted mostly to limestone glades in Alabama, Tennessee, and Kentucky. It is distinct from the other hirsute-pilose-stemmed plants sympatric with it in those states, the latter identified here as *O. colorea*. The range of *O. colorea* continues northeastward as far as New Jersey (sporadically from North Carolina northward).

* *Oxalis florida* is a species primarily of the Atlantic coastal plain, although plants in Texas, Louisiana, southwestern Mississippi, Arkansas, and Missouri are identified here as *O. florida*. Intermediates between *O. florida* and *O. colorea* apparently occur where their ranges meet.

* *Oxalis texana* is centered primarily in Texas, Louisiana, and Arkansas. Plants tentatively identified here as *O. texana* in southern Alabama adjacent Florida are slightly atypical and may prove to be more closely related to *O. colorea*, *O. florida*, or *O. dillenii*.

Key to species of the *Oxalis dillenii* group

1. Stems strigose, hairs straight, closely appressed, and usually dense (rare central Louisiana populational variants of *O. texana* irregularly villous proximally); petals with or without red lines at base.

    2. Flowers 1 or 2–3(–5, very rarely to 8) in umbelliform (rarely irregular) cymes, mostly homostylous; petals 6–12 mm, all yellow, not red-lined at base; plants single-stemmed or caespitose to colonial from rhizomes or rhizomelike branches; open areas, often disturbed ..... **Oxalis dillenii**
    2. Flowers (2–)3–5(–8) in umbelliform cymes, very rarely irregular cymes, distylous; petals 11–15 mm (Arkansas, Louisiana, Texas) or 6–12 mm (Alabama, Florida), red-lined at base; plants caespitose or with short stolon-like offsets; sandy woodlands (Texas, Louisiana, Arkansas) or open, disturbed sites (Alabama, Florida) ..... **Oxalis texana**

1. Stems hirsute-pilose to loosely strigose; petals usually with red lines at base, the lines strong to faint, sometimes absent.

3. Stems sparsely to moderately strigose with loosely antrorsely appressed hairs or nearly glabrous, uncommonly sparsely villous proximally, hairs 0.2–0.6 mm, slightly curved; petals mostly 4–8 mm, red lines faint or absent ..... **Oxalis florida**
3. Stems hirsute-pilose on at least proximal 2/3, hairs (0.3–)0.5–1.3 mm, curving, loosely and irregularly spreading; petals 9–20(–23) mm, red lines strongly to weakly evident, occasionally apparently absent.

    4. Petals (13–)15–20(–23) mm, strongly red-lined; pedicels sparsely villous with long hairs; capsules sparsely to densely hirsute-pilose with long, deflexed, nonseptate hairs; plants strongly colonial; in limestone glades and barrens, chalk prairies, and rocky, limestone habitats **Oxalis macrantha**
    4. Petals 9–15 mm, strongly to weakly red-lined or lines occasionally apparently absent; pedicels sparsely closely to loosely strigose with short, upward-arching hairs; capsules nearly glabrous or puberulent to sparsely hirsute-strigose along the angles; plants caespitose or weakly colonial; in a wide variety of habitats ..... **Oxalis colorea**

Other paired-species comparisons

1. Stems glabrous to sparsely and loosely strigose proximally, less commonly villous, with slightly curving, antrorsely oriented hairs 0.2–0.6 mm long; petals mostly 4–8 mm, red lines usually faint or absent; rhizomatous branches and proximal stems herbaceous and slender, without a taproot ..... **Oxalis florida**
1. Stems hirsute-pilose proximally with spreading hairs 0.3–1.3 mm long; petals 9–15 mm, red lines usually strongly evident; rhizomatous branches and proximal stems usually at least slightly lignescent and thickened, taproot often evident ..... **Oxalis colorea**

1. Stems glabrous to sparsely or moderately strigose with loosely antrorsely appressed , slightly curved hairs or nearly distally; capsules nearly glabrous or puberulent to sparsely puberulent along the angles; petals mostly 4–8 mm ..... **Oxalis florida**
1. Stems densely strigose with straight, antrorse, closely appressed, hairs; capsules densely puberulent over the whole surface; petals 6–12 mm ..... **Oxalis dillenii**

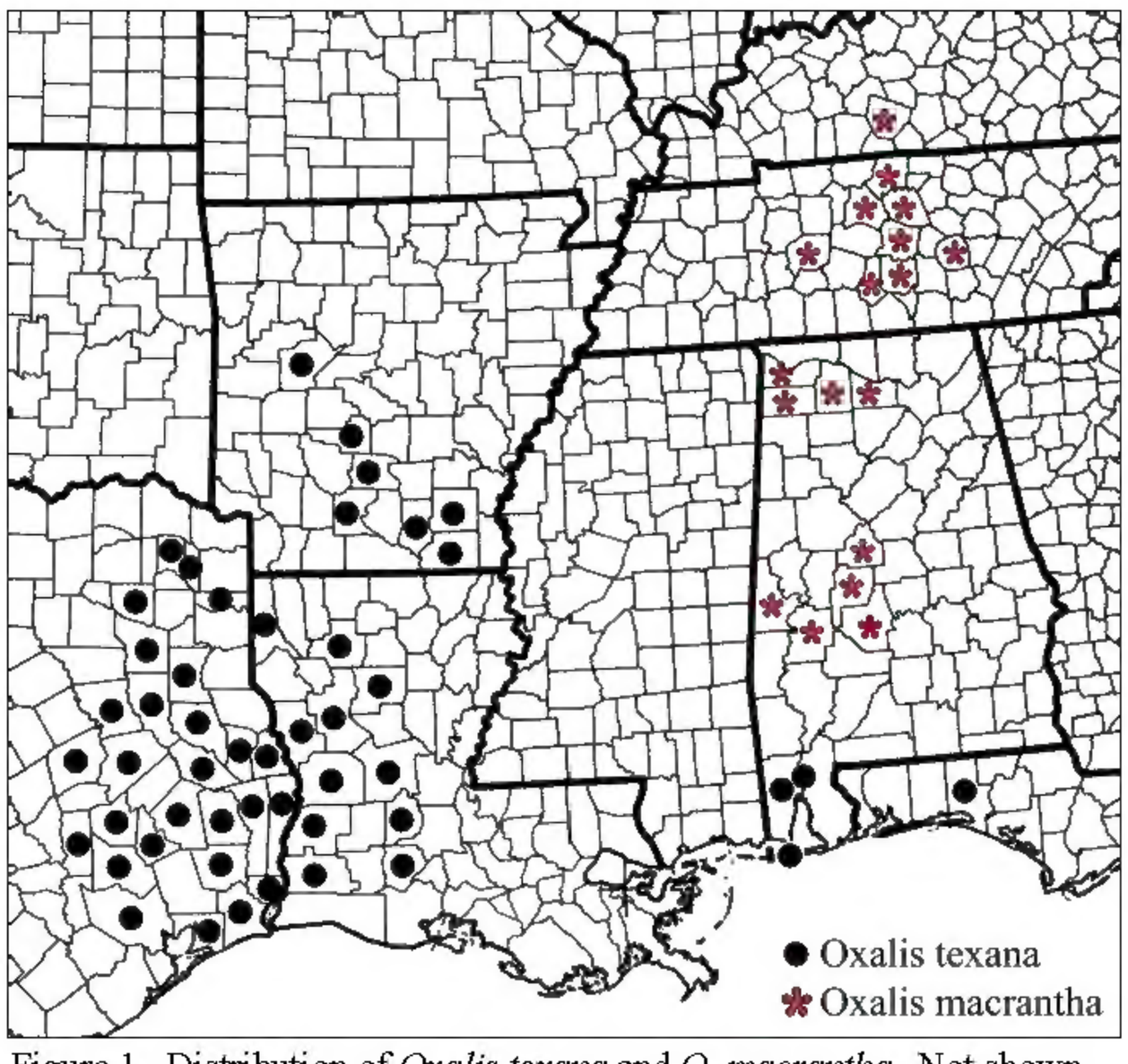

Figure 1. Distribution of *Oxalis texana* and *O. macrantha*. Not shown for *O. texana*, a locality in Goliad Co., Texas, slightly to the southwest.

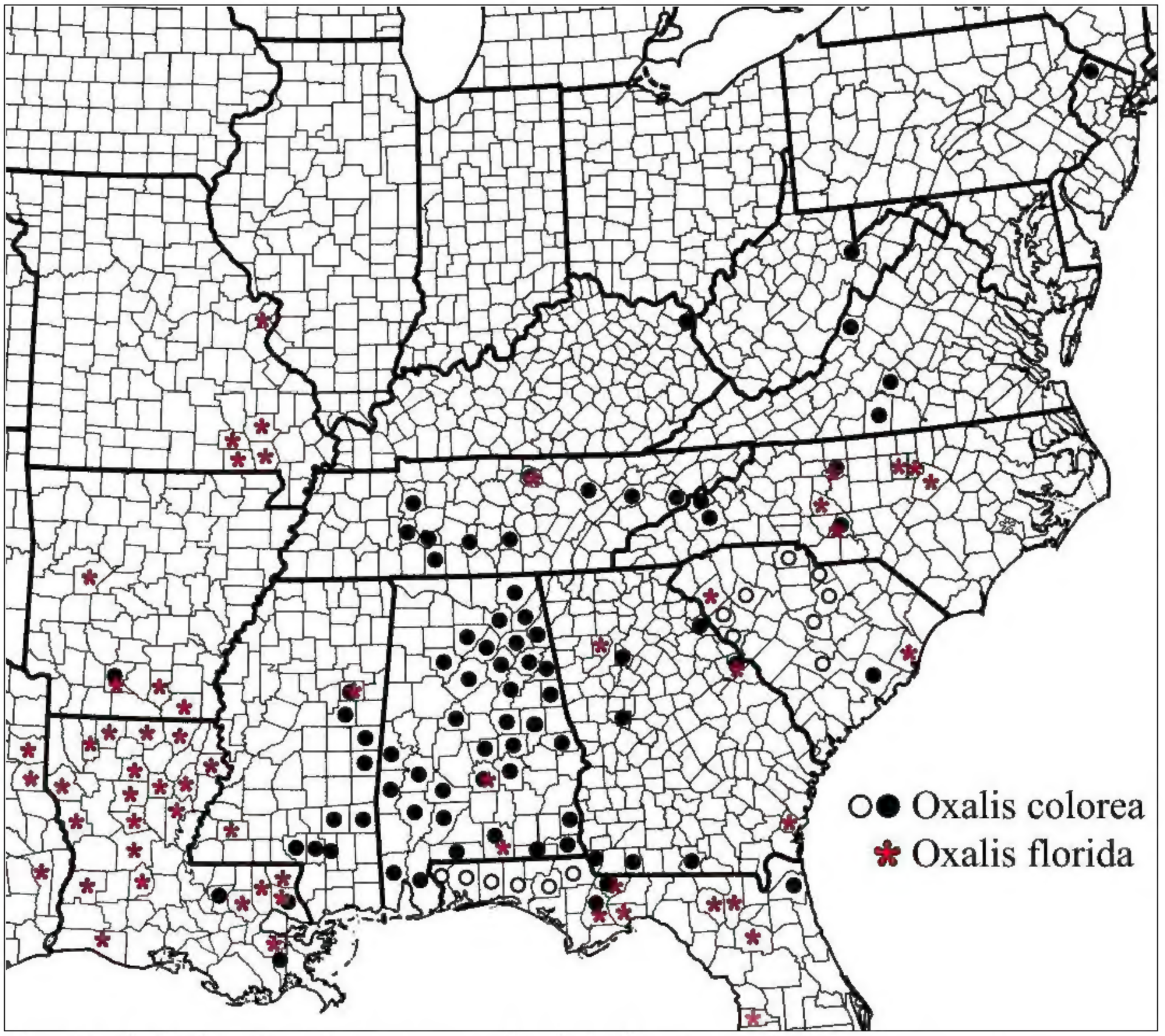

Figure 2. Distribution of *Oxalis colorea* and partial distribution of *O. florida*. Open symbols are from literature, vouchers not seen in the present study (Florida–Ward 2004; South Carolina–SC Atlas 2013). The range of *O. florida* continues south in peninsular Florida (records for Hillsborough, Indian River, Lee, and Manatee counties at MO) and north of North Carolina into New England. Records for *O. florida* in George, South Carolina, and North Carolina are based on study of few collections --- the distribution there probably is much more dense and needs to be studied in detail.

1. OXALIS DILLENII Jacq., Oxalis, 28. 1794. *Oxalis corniculata* var. *dillenii* (Jacq.) Trel. in A. Gray, Syn. Fl. N. Amer. 1(1): 365. 1897. *Xanthoxalis dillenii* (Jacq.) Holub, Bot. Közlem. 59: 38. 1972. **TYPE**: Jacquin noted in the protologue "Plantam non vidi. Omnia ex Dillenio desumpsi" [Plant not seen. It is entirely selected from Dillenius], thus the name is based on the description and illustration by Dillenius in Hortus Elthamensis 2: f. 298, t. 221. 1732. The plant illustrated probably was raised from seed from a collection made by Mark Catesby, as Sherard and Dillenius had received nearly a full set of Catesby's specimens from eastern North America (Reveal 1983). It apparently is the specimen in Dillenius's herbarium under his phrase-name "Oxys lutea americana, humilior et annua," *Dillenius s.n.* (holotype: OXF).

Oxalis dillenii var. *radicans* Shinners

Oxalis prostrata Haworth; *Oxalis florida* Salisb. subsp. *prostrata* (Haworth) Lourteig

Oxalis lyonii Pursh; *Oxalis corniculata* var. *lyonii* (Pursh) Zucc.

Plants perennial, caulescent, arising from ligneous or lignescent rhizome, sometimes appearing taprootlike. **Stems** usually 2–8 from base, erect initially, 10–25 cm, herbaceous or sometimes becoming lignescent proximally, often becoming decumbent to procumbent and rhizomelike, sometimes rooting at nodes, sometimes proximally lignescent, densely and evenly strigillose to strigose from base to peduncles and pedicels with straight, antrorsely appressed, nonseptate, sharp-pointed hairs. **Leaves** basal and cauline; stipules oblong, margins narrowly flanged or without any free portion, without free apical auricles; petiole 1–4 cm; leaflets 3, green on both surfaces, obcordate, lobed 1/5–1/3 length, (4–)6–15(–21) mm, sparsely strigillose abaxially, glabrous adaxially, oxalate deposits absent. **Peduncles** 1–6(–10) cm. **Flowers** 1 or 2–3(–5, very rarely to 8) in umbelliform (rarely irregular) cymes, mostly homostylous; pedicels in fruit deflexed (to horizontal), usually without bracteoles; sepal apices without tubercles; petals yellow, without red lines, 5–11 mm. **Capsules** angular-columnar, abruptly tapered at apex, 12–20(–25) mm, densely strigose-pilose with mixture of appressed and spreading hairs, with puberulent understory. **Seeds** brownish, transverse ridges with strong grayish or white lines. ***2n*** = 18, 20, 22, 20–24.

Flowering Feb–May(–Oct). Pastures, roadsides, lawns, river bottoms, sandy, rocky, or gravelly soils; 0–300 m; Alta., Man., N.B., N.S., Ont., P.E.I., Que., Sask.; Ala., Ariz., Ark., Colo., Conn., Del., D.C., Fla., Ga., Idaho, Ill., Ind., Iowa, Kans., Ky., La., Maine, Md., Mass., Mich., Minn., Miss., Mo., Nebr., N.H., N.J., N.Mex., N.Y., N.C., N.Dak., Ohio, Okla., Oreg., Pa., R.I., S.C., S.Dak., Tenn., Tex., Vt., Va., Wash., W.Va., Wis., Wyo.; introduced in Bermuda, Europe.

Oxalis dillenii is highly variable, perhaps polymorphic, especially in habit. A relatively simple and potentially effective approach toward better understanding of the biology would be through a study of chromosome number variation. The geographic range of *O. dillenii* is extensive, apparently completely sympatric with all of the other taxa considered here.

2. OXALIS FLORIDA Salisb., Prodr. Stirp. Chap. Allerton, 322. 1796. **TYPE: USA.** From seeds from South Carolina, probably collected by John Fraser, cultivated in Hortus Chapel Allerton, 1789, *Salisbury s.n.* (holotype: BM digital image!; isotype: G-DC). Fide Lourteig 1979.

Oxalis recurva Ell.; *O. dillenii* subsp. *recurva* (Ell.) C.F. Reed; *O. florida* var. *recurva* (Ell.) H.E. Ahles

Oxalis brittoniae Small

Oxalis filipes Small; *Oxalis dillenii* subsp. *filipes* (Small) Eiten; *Oxalis florida* var. *filipes* (Small) H.E. Ahles; *Xanthoxalis filipes* (Small) Small

Plants perennial, caulescent, arising from very slender stolons or rhizomes, youngest plants apparently beginning from short, slender taproots. **Stems** usually single from base, erect or rarely leaning and decumbent, (5–)8–30(–35) cm, herbaceous, not rooting at nodes, glabrous or subglabrous to sparsely or moderately loosely strigose with fine, slightly curving, antrorsely oriented, non-septate hairs 0.2–0.6 mm, uncommonly sparsely villous proximally. **Leaves** basal and cauline; stipules rudimentary, without free margins or apical auricles; petiole 2–5 cm; leaflets 3, green on both surfaces, obcordate, lobed 1/5–1/3 length, 4–11 mm, sparsely strigose abaxially, oxalate deposits absent. **Peduncles** (2–)3–8 cm. **Flowers** 1 or 2(–3 in umbelliform cymes at level of leaves or slightly above, tristylous; pedicels in fruit reflexing to ascending, often bracteolate; sepals 3.5–5 mm, glabrous, apices without tubercles; petals yellow, sometimes faintly red-lined at base, mostly 4–9 mm. **Capsules** angular-cylindric, 7–10 mm, glabrous or glabrate to sparsely puberulent with short hairs, sometimes only along the angles. **Seeds** all brown, transverse ridges brown. ***2n*** = 16.

Flowering Mar–May(–Aug). Low woods, swamp forests, rich woods, pine woods, sandy sites, burned-over woods, ditches, roadside banks, flood plains, low fields, lake edges, creek banks, pastures, disturbed sites, bluffs, rocky slopes; 10–400 m; Ark., Conn., D.C., Fla., Ga., Ind., Ky., La., Maine, Md., Mass., Miss., Mo., N.H., N.J., N.Y., N.C., Pa., S.C., Tex., Vt., Va., W.Va.

Oxalis florida is recognized by its mostly erect stems, thin stems and peduncles (compared to other species), glabrous to sparsely strigose cauline vestiture of relatively short, slightly and loosely curved hairs, obsolescent stipules, relatively small, and yellow flowers usually without red lines in the throat. It is a species of the Atlantic states and Gulf coast but it also occurs in Texas, Louisiana, southwestern Mississippi, Arkansas, and Missouri, apparently disjunct westward from its main range. The eastern and western expressions of *O. florida* perhaps are different evolutionary entities.

Plants of *Oxalis florida* in the western segment of the range apparently range in habit to more robust than those of the east and often appear to differ from typical *O. dillenii* only in vestiture. The two entities in this region, however, appear to exist in sympatry, occasionally forming intermediates. Observations by George Eiten accompanying labels of *Oxalis florida* from Louisiana: Sabine Parish: "Analysis of mass collection of 43 specimens [*Gregory & Eiten 14a* and *14b*] shows 37 are 'good' O.D. *filipes* (such as the specimens on this sheet), 2 are O.D. *filipes* with possible introgression from O.D. *dillenii*, 3 are O.D. *filipes* with quite certain introgression from O.D. *dillenii*, and 1 plant is good O.D. *dillenii*." Sabine Par.: picnic grounds, side of Rte 171, 5.4 mi N of jct with Rte 6 at Many, 4 Jun 1956, *Gregory & Eiten 14b* (MO). Beauregard Parish: Mass collection [*Gregory & Eiten 27a*] shows 12 plants are 'good' O.D. *filipes*, 1 is good O.D. *dillenii*, and 1 is hybrid between the 2 subspecies." Beauregard Par.: 4 Jun 1956, *Gregory & Eiten 27a* (SMU).

In addition to the records for *Oxalis florida* in Texas shown on Figure 2, plants with greatly reduced cauline vestiture occur in scattered localities through eastern counties (e.g., Harrison, Henderson, Hood, Jasper, Kaufman, Milam, Newton, Robertson, Sabine cos.). These plants, however, produce densely puberulent capsules, in contrast to the sparsely strigose to strigillose or nearly glabrous capsules more characteristic of *O. florida*.

Intermediates apparently occur where the ranges of eastern *Oxalis florida* and *O. colorea* come into contact. For example, *Kral 57346* has large (12 mm), red-lined petals like *O. colorea* but the habit and vestiture of *O. florida*: **Florida**. Gadsden Co.: wooded bluffs of Apalachicola River, S side of Chattahoochee, 18 Mar 1976, *Kral 57346* (MO, VDB). Other plants of intermediate morphology are noted in the comments following *O. colorea*.

Oxalis florida is very abundant in Louisiana (specimens not cited) and probably more abundant in Arkansas than indicated on Figure 2. **Arkansas**. Ashley Co.: Gas line right-of-way and clearcut pine woods W of Ark 133, 2.6 mi S of US 82, S of Crossett, 5 May 1985, *Thomas & Hooks 91822* (NLU). Bradley Co.: Ditch and beside fence, Camp Mansfield access road, 0.6 mi E of the Old Monticello Road, SE of Warren, 23 Nov 1985, *Leslie & Harris 1570* (NLU); Johnsville Prairie 5.9 mi SW of Johnsville on unnamed county road, flat open prairie and sparse woods, 5 Aug 1984, *Thomas et al. 90300* (NLU); along Deer Run Trail in Moro Bay State Park E of Ark 15, 12 Apr 1986, *Thomas & Leslie 95377* (NLU). Ouachita Co.: Clearcut woods on both sides of Ouachita Co. Rd. 545 at Co. Rd. 53, 4 mi SW of Elliott and Ark. 276, 19 Sep 2001, *Thomas & Doffitt 171,788* (NLU). Yell Co.: dry, open, rocky hillsides above Nimrod Dam, Fourche River, Ola P.O., 450 ft, 10 Apr 1941, *Demaree 22653* (MO). **Louisiana**. East Baton Rouge Par.: Baton Rouge, Capitol Heights, 18 Apr 1928, Brown 1908 (SMU). Jefferson Par.: voucher seen but not recorded. St. Tammany Par.: 8.7 mi NE of Covington, silty roadside, 20 Apr 1962, *Shinners 29,633* (SMU). **Mississippi**. Franklin Co.: Homochitto Natl. Forest, disturbed basin of Okhissa Lake site at end of USFS 149, E of US 98 S of Bude, 11 Apr 2003, *Thomas & Havran 173,698* (NLU). **Missouri**. Butler Co.: Poplar Bluff, 14 Aug 1892, *Dewart s.n.* (MO); Mud Creek Natural Area, Mark Twain Natl. Forest, just W of Stoddard Co. line and ca. 2 mi E of Co. Hwy T via dirt road, ca. 7 air mi NE of Poplar Bluff, 370 ft, bottomland oak-hickory forest with occasional swampy areas of *Taxodium*, *Populus*, *Acer*, and *Nyssa*, scattered on muddy banks of stream, 14 Sep 1991, *G. & K. Yatskievych 91-222* (MO). Carter Co.: Grandin, not very common in woods, 6 May 1901, *Bush 363* (MO). Ripley Co.: Doniphan, common in woods, 16

May 1900, *Bush 277* (MO-2 sheets); Pleasant Grove, common in woods, 18 May 1900, *Bush 306* (MO). St. Louis Co.: Ca. 2 mi E of Valley Park, between Meramec River and Marshall Road, near ball park, weedy in open area among grasses, 10 May 1990, *Taylor 5997* (NLU). Wayne Co.: Wappapello Lake State Park, oak hardwood forest and along lake shore, 90 m, 19 May 1999, *Rakotonandrasana et al. 346* (MO). **Texas**. Harrison Co.: Caddo Lake State Park, 12 Apr 1976, *Fleetwood 12135* (BRIT) and *12147* (BRIT). Jasper Co.: ca. 7 mi S of Kirbyville, ca. 2 mi E of Hwy 96, ca. 0.2 mi N of end of unpaved road, wooded uplands, 17 Oct 1977, *Ajilvsgi 5519* (BRIT); 12.5 mi SW of Jasper, edge of water at roadside spring, 10 Oct 1945, *Cory 49826* (SMU). Panola Co.: 12.3 mi SSE of Carthage, sandy stream-bottom woods, 7 Jun 1955, *Shinners 20186* (SMU).

3. OXALIS COLOREA (Small) Fedde, Just's Bot. Jahresber. 32: 410. 1905. *Xanthoxalis colorea* Small, Fl. S.E. U.S. 668, 1333. 1903. *Oxalis priceae* subsp. *colorea* (Small) Eiten, Amer. Midl. Nat. 69: 302. 1963. **TYPE**: **USA. Georgia**. DeKalb Co.: On and about Stone Mt., 100–1500 ft, 1-16 May 1895, *J.K. Small s.n.* (holotype: NY digital image!; isotypes: F, NY digital image!).

Plants perennial, caulescent, arising from a slender lignescent taproot, sometimes with short, lignescent, stoloniform (or offsetlike) rhizomes. **Stems** usually 1–4 from base, mostly erect, 5–15(–25) cm, proximally often lignescent, hirsute-pilose with nonseptate hairs 0.3–1.3 mm long on proximal portion of stem, spreading or slightly deflexed, usually in dissimilar orientations, sometimes loosely antrorsely oriented on peduncles and pedicels. **Leaves** basal and cauline; stipules oblong, with margins narrowly flanged or without any free portion, without free apical auricles; petiole 2–7 cm; leaflets 3, green on both surfaces, obcordate, lobed 1/5–1/3 length, 3–8 mm, sparsely strigose-hirsute on both surfaces, less commonly glabrate, oxalate deposits absent. **Peduncles** (3–)5–10(–15) cm. **Flowers** (1–)2–4(–5) in umbelliform cymes, less commonly irregular cymes, produced well above level of leaves, tristylous (fide Mulcahy 1964); pedicels in fruit deflexed to horizontal, often bracteolate, sometimes branched; sepals 3.5–5 mm, apices without tubercles; petals 9–15 mm, yellow to orange-yellow, with prominent red stripes at base (corolla throat), stripes rarely faint, very rarely apparently absent. **Capsules** angular-cylindric, abruptly tapered at apex, 6–16 mm, glabrous or glabrate to sparsely puberulent with short hairs, sometimes only along the angles or at the apex. **Seeds** brown, usually with white transverse ridges. ***2n*** = unknown.

Flowering (Mar–)Apr–May(–Oct). Longleaf pine, longleaf pine-scrub oak, pine-mixed hardwood, hardwood, beech-magnolia, and alluvial woods, shale slopes, sandstone outcrops, granite outcrops, limestone, river and stream banks, hillsides and ridges, bluffs, ravines, clearings, roadsides; 30–300 m; Ala., Fla., Ga., La., Miss., Mo., N.J., N.C., S.C., Tenn., Va., W.Va.

Oxalis colorea is densely distributed in southeastern Mississippi, Alabama, and probably the northern half of Georgia; outliers apparently occur in a wider area toward the north and northeast. Other collections examined. **Arkansas**. Ouachita Co.: Low hills, P.O. Camden, 150 ft, 1 Apr 1938, *Demaree 16789* (MO). **Florida**. Duval Co.: S. Jacksonville, 5 Apr 1897, *Churchill s.n.* (MO). Liberty Co.: Aspalaga, 1898, collector not specified (MO). **Kentucky**. Boyd Co.: Ashland, open, dry banks, 13 May 1935, *Demaree 11313* (SMU). **New Jersey**. Sussex Co.: woods along Flatbrookville-Stillwater Rd., between the Appalachian Trail and Vancampens Brook, open disturbed area, 29 May 1979, *Morton 7719* (VDB). **North Carolina**. [Buncombe Co.:] Asheville, no date, *Ashe 2075* (BRIT, MO); Biltmore, woodlands, 27 May 1898, *Biltmore Herb. 5383a* (MO). Forsyth Co.: Sink Rock, rocky places, 1 May 1934, *Schallert 3651* (SMU). Madison Co.: just E of Tenn. state line on N side of the French Broad River, W of Hot Springs, talus and alluvial woods, 8 May 1976, *Boufford 18107* (MO); RR at Hot Springs, 1 Jun 1899, *Churchill s.n.* (MO). Stanly Co.: near Charlotte, rocky slopes below bluffs of Yadkin River, 20 Apr 1932, *Palmer 39985* (GH, MO); steep moist banks above the Yadkin River, just above the second or lower power dam east of Badin, 10 May 1963, *Wilbur 6826* (GH). **Tennessee**. [Cocke Co.]: Wolf Creek, 28 Jul 1894, *Kearney s.n.* (MO); Wolf Creek, Jul 1894, *Ruth s.n.* (MO); Wolf Creek, dry open woods, Aug 1894 , *Ruth s.n.* (BRIT-2 sheets); near Del Rio,

siliceous bluffs along Newport Rd., 18 Apr 1963, *Sharp et al. 17255* (TENN digital image!). Knox Co.: open woods, Knoxville, Jun 1896, *Ruth s.n.* (MO). Lawrence Co.: ca. 4.5 mi S Rockdale and ca. 1/2 mi E of US 43, sandy clay of oak barren by Staggs Road, 16 May 1973, *Kral 49995* (MO); others from VDB. **Virginia**. Bath Co.: Blackies Hollow, scattered in more open or thinly vegetated openings close to ridgetop, SE side of shale barren spur ridge N of State Rte 629 along (E of) Cowpasture River, 6 km E of Bath Alum, 17 May 1994, *Wieboldt 8890* (VDB). Campbell Co.: W of Altavista near Leesville, micaceous road cut, 8 May 1961, *Kral 12274* (VDB). Pittsylvania Co.: Along Banister River 3.3 km downstream from State Rte. 832 bridge, 3 km NE of Motleys Mill and 15 km SW of Mt. Airy, very dry, SE-facing bluff, open hardwood/red cedar canopy, 25 Apr 1995, *Wieboldt 9176* (VDB). **West Virginia**. Tucker Co.: Otter Creek Lumber Co., near Hendriks, dry grounds along railroad track, 10 Sep 1904, *Greenman 400* (GH).

Plants of one Mississippi collection from within the geographic range of *Oxalis colorea* have the habit and prominently red-lined petals of *O. colorea*; stem hairs are relatively long but they are antrorsely oriented as in *O. florida*. These plants are considered and mapped here as variants of *O. florida* but they may be better interpreted as populational variants of *O. colorea*. **Mississippi**. Oktibbeha Co.: Botanic Garden of the South, ca. 1.2 mi S of Sessums, S27, NE levee, common, 12 Apr 1992, *McDaniel 31380* (VDB). Similar variation also was encountered, equally rarely, in Alabama and Tennessee. **Alabama**. Covington Co.: Pinelands ca. 5 mi N of Florala on US Hwy 31, 28 Mar 1971, *Kral 41876* (NLU); Lowndes Co.: Blue Bluff at Corps of Engineers' Holy Ground Battlefield Park, S shore of Alabama River, ca. 2 1/4 mi NE of Whitehall, 7 Apr 1982, *Gunn 373* (VDB). **Tennessee**. Jackson Co.: Ca. 5 mi S of Gainesboro, cherty, clay loam of clearing in wooded ravine E of TN 56, 24 Apr 1992, *Kral & Moore 80219* (VDB).

The collection cited above from Forsyth Co., North Carolina, has one plant with distinctive colorea-like stem vestiture but stems of the other four have loosely antrorse hairs.

4. OXALIS MACRANTHA (Trel.) Small, Bull. Torrey Bot. Club 23: 268. 1896. *Oxalis corniculata* var. *macrantha* Trel., Mem. Boston Soc. Nat. Hist. 4: 88, plate 11, fig. 5. 1888. **LECTOTYPE** (Lourteig 1979): **USA. Alabama**. No other locality data, no date, *P. Hatch s.n.* (GH!).

Oxalis hirsuticaulis Small, Bull. Torrey Bot. Club 25: 611. 1898.

Oxalis priceae Small, Bull. Torrey Bot. Club 25: 612. 1898; *Xanthoxalis priceae* (Small) Small, Fl. S.E. U.S. 668. 1903.

Plants perennial, caulescent, arising from ligneous or lignescent taproot, usually with numerous, lignescent, stoloniform (or offsetlike) rhizomes rooting at nodes and producing erect stems from nodes. **Stems** usually 2–8 from base, erect or usually becoming decumbent, 5–20(–40) cm, proximally lignescent, hirsute-pilose with nonseptate hairs 0.3–1.3 mm on proximal portion of stem, spreading to slightly deflexed, usually in dissimilar orientations. **Leaves** basal and cauline; stipules oblong, with margins narrowly flanged or without any free portion, without free apical auricles; petiole 2–7 cm; leaflets 3, green on both surfaces, obcordate, lobed 1/5–1/3 length, 4–12 mm, strigose-hirsute on both surfaces, less commonly glabrate, oxalate deposits absent. **Peduncles** (3–)5–10(–15) cm. **Flowers** (1–)3–8 in umbelliform cymes, less commonly irregular cymes, produced well above level of leaves, distylous (fide Mulcahy 1964); pedicels in fruit deflexed to horizontal, often bracteolate; sepals 4–6 mm, apices without tubercles; petals yellow, with prominent red stripes at base (corolla throat), (13–)15–20 mm. **Capsules** angular-cylindric, abruptly tapered at apex, 10–15 mm, moderately to densely hirsute-pilose with long, deflexed, nonseptate hairs, sometimes mostly along the angles. **Seeds** brown, usually with white transverse ridges. ***2n*** = unknown.

Flowering Mar–May. Dry limestone glades, cedar barrens, chalk prairies, limestone bluffs and outcrops; 100–250 m; Ala., Ky., Tenn.

Oxalis macrantha is restricted mostly to limestone glades and chalk prairies in Alabama, Tennessee, and Kentucky. It is distinct from the other hirsute-pilose-stemmed plants sympatric with it in those states, the latter identified here as *O. colorea*. Earlier use by Nesom (2009) of the name *Oxalis priceae* Small for this species was incorrect, based on a misinterpretation of the publication data of *O. macrantha*.

5. OXALIS TEXANA (Small) Fedde, Just's Bot. Jahresber. 32: 410. 1905. *Xanthoxalis texana* Small, Fl. S.E. U.S. 667, 1332. 1903. *Oxalis recurva* var. *texana* (Small) Wieg., Rhodora 27: 138. 1925. *Oxalis priceae* subsp. *texana* (Small) Eiten, Amer. Midl. Naturalist 69: 301. 1963. **TYPE: USA. Texas**. Brazoria Co.: Alvin, 20 Apr 1894, *E.N. Plank s.n.* (holotype: NY digital image!).

Plants perennial, caulescent, arising from woody taproot, cespitose with stems arising from caudex or with rhizomelike offsets or stolons rooting at nodes. **Stems** most 2–6, erect to ascending, 5–15 cm, proximally ligneous to lignescent, evenly strigose to strigillose from base to peduncles and pedicels with straight, antrorsely appressed to closely ascending, nonseptate hairs. **Leaves** basal and cauline; stipules oblong, usually with margins very narrowly flanged, usually with rounded and slightly free apical auricles; petiole 2–6 cm; leaflets 3, green to purple on both surfaces, cordate, lobed 1/5–1/3 length, (4–)6–12(–18) mm, sparsely strigose abaxially, glabrous to sparsely strigose adaxially, oxalate deposits absent. **Peduncles** 4–10 cm. **Flowers** (2–)3–5(–8) in umbelliform cymes, very rarely irregular cymes, distylous; pedicels in fruit horizontal to deflexed, without bracteoles; sepal apices without tubercles; petals yellow, with prominent red lines at base (corolla throat), (10–)12–16(–17) mm. **Capsules** angular-columnar, abruptly tapered at apex, 8–15 mm, moderately to densely puberulent to puberulent-villous. **Seeds** brownish, transverse ridges distinctly whitish. ***2n*** = unknown.

Flowering Mar–May(–Jun). Commonly in undisturbed habitats and usually in deep, loose sand, but also fields, roadsides, and edges and openings in woods, pine, pine-oak, and mixed hardwoods; 10–200 m; Ala., Ark., Fla., La., Tex.

Representative collections examined. **Arkansas**. Bradley Co.: Warren, prairie, 200 ft, 10 Apr 1943, *Demaree 24233* (SMU). Dallas Co.: 2.6 mi WSW of Fordyce, roadway in pine-oak woods, fine sandy clay, 1 May 1955, *Shinners 19892* (SMU). Drew Co.: Monticello, ridge, pine woods, 10 Apr 1937, *Demaree 14374* (SMU); Monticello, ridge thickets, 250 ft, 26 Mar 1938, *Demaree 16738* (SMU). Hot Springs Co.: Magnet Cove, low hills, 550 ft, 18 Apr 1937, *Demaree 14564* (SMU); Magnet Cove, rocky limestone hills, 550 ft, 2 May 1937, *Hale 220* (VDB). Marion Co.: 18 mi W of Yellville, along road and wooded hillside, 15 Apr 1976, *Lipscomb 1254* (BRIT). **Louisiana**. Numerous collections from Acadia, Beauregard, Bienville, Calcasieu, Evangeline, Natchitoches, Rapides, Sabine, and Vernon parishes. **Texas**. Collections studied from TEX-LL, BRIT-SMU, MO, NLU.

Nesom (2009), following Eiten (1963), cited a collection (*Ewan 17608*) from Rapides Parish, La., as *Oxalis priceae*, (interpreted here now as *O. colorea*) but recent field observations in Rapides Par. show that populations of *O. texana* (e.g., *Nesom 2013-1*, cited below) occasionally produce individuals with a tendency for stem hairs to be spreading on proximal portions. Otherwise, all have closely antrorsely appressed stem hairs characteristic of *O. texana*. **Louisiana**. Rapides Par.: Red River valley, near Zimmerman RR Sta., frequent in dryer spots beneath tall pines on crest of hills, 24 Apr 1948, *Ewan 17608* (MO); Kisatchie Natl. Forest, ca. 15 air mi SW of Alexandria center, ca. 10 air mi SSW of Alexandria Interntl. Airport, jct La. Hwy 488 and FS Road 240 to USAF Claiborne Bombing Range at N side of range area, recently controlled-burn area (probably in 2011 or 2012), loblolly pine emphasis with mixed oak-hickory and sassafras, gentle slopes, sandy soil, elev. 225 ft, with *Pteridium aquilinum*, *Rhus copallina*, *Rhus toxicodendron*, *Oxalis violacea*, *Glandularia*

canadensis, *Hypoxis*, *Tephrosia*, *Pityopsis*; locally common within woods but not along roadsides or in other disturbances, 27 Apr 2013, *Nesom 2013-1* (BRIT, and to be distributed).

The Alabama plants identified here as *Oxalis texana* all are from Dauphin Island and localities in and around Mobile (Fig. 1). Only a single collection has been seen from Florida. Compared to those in Texas and Louisiana, these more eastern plants have shorter petals (6–12 mm vs. (10–)12–16(–17) mm long), a more colonial habit (taprooted, usually with long, lateral, rhizome-like branches vs. taprooted, commonly with short basal offsets), and they grow in disturbed sites (vs. mostly undisturbed sites, usually within woods). It is plausible that they may prove to be more closely related to *O. colorea* than to the more western *O. texana*. Orientation of cauline vestiture is weighted in the identification here of the Alabama plants.

Specimens examined. **Alabama**. Baldwin Co.: weedy along disturbed roadside on E side of Hwy 225, ca. 0.3 mi S of Dennis Creek, 18 Mar 2012, *Horne 1748* (AMAL). Mobile Co.: Dauphin Island, dry sunny roadside ditch near ine forest, 9 May 1964, *Deramus D60* (BRIT); Dauphin Island, common in sandy soils of relatively open, weedy lawn at 710 Cadillac Avenue, 4 Mar 2012, *Horne 1733* (AMAL); Dauphin Island, open lawn of residence at 722 Cadillac Avenue, ca. 500 ft W of Horne 1733, 4 Mar 2012, *Horne 1735* (AMAL); Dauphin Island, weedy lawn around island's water tower directly S of the 3-way stop intersection of Bienville Blvd. and LeMoyne Drive (Hwy 193), 10 Mar 2012, *Horne 1737* (AMAL); Alabama State Park Authority property, weedy along edge of small dirt parking lot at Entrance B of the Mud Lakes Disposal Area on the E side of Hwy 90 near the S end of the Cochrane Bridge over the Mobile River, 17 Mar 2012, *Horne 1740* (AMAL); Dauphin Island, Audubon Bird Sanctuary, shaded understory of mesic maritime woods along trail leading from parking lot to Banding Area, 7 Mar 2012, *Horne 1744* (AMAL); Mobile, common around Rochelle's Diner at 2904 Spring Hill Ave, 19 Mar 2012, *Horne 1751* (AMAL); Mobile, weedy along disturbed western edge of parking lot for B.A. Vitter & Assoc., 8060 Cottage Hill Rd, 19 Mar 2012, *Horne 1752* (AMAL, BRIT); Dauphin Island, mesic coastal pine forest of Audubon Bird Sanctuary along trail leading from parking lot to Banding Area, 2 Apr 2012, *Horne 1757* (AMAL); Dauphin Island, open, grassy roadside on S side of Infanta Place, ca. 100 ft E of its intersection with Iberville Drive, 10 Feb 2013, *Horne 1975* (BRIT); Dauphin Island, pine woods near water tower, 25 Mar 1973, *Taylor 12746* (BRIT). **Florida**. Walton Co.: Four Mile Village area of Coffeen Nature Preserve, S of Hwy 98, E of Sandestin, frequent in sand of interdune swales, 4 Mar 1990, *Anderson 12575* (MO).

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